

REMARKS

1. Claim Rejections - 35 U.S.C. § 103

Claims 1, 4, 10, and 12 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,828,133 to Ishigami in view of U.S. Patent No. 6,229,634 to Smith. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Independent claim 1 sets forth a device for increasing the perceived bandwidth in an audio signal path with limited bandwidth. As claimed, a splitter is adapted to divide the audio signal path from an input terminal into a first branch for passing a first part of the audio signal and a second branch for processing a second part of the audio signal. The claimed second branch comprises a harmonic generator for producing out-of-band harmonics of the audio signal. As recited in claim 1, at an output terminal that is connectable to a speaker unit, a combiner adds the out-of-band harmonics from the second branch to the first part of the audio signal. One of the advantages of the claimed invention is that the addition of out-of-band harmonics to a sound signal in a device with limited bandwidth enhances the quality of the resultant audio signal without having to increase the device's bandwidth or memory size.

According to the Examiner, Smith discloses a limiter that produces out-of-band harmonics, and the Examiner alleges it would have been obvious to modify Ishigami's harmonic generator to produce out-of-band harmonics in order to gain an improved output signal. Applicant respectfully submits that Smith does not encourage such a modification.

Ishigami is directed to a speech quality improving system for low frequency audio signals in communication systems such as telephone and radio systems. The reference discloses generating higher harmonic components of one branched signal and combining the harmonics with the other branched signal. As stated by the Examiner, Ishigami fails to disclose a harmonic generator for producing out-of-band harmonics, as claimed.

Smith is directed to a burst mode optical digital receiver that up-converts the frequency of the output of an opto-electronic detector, amplifies the up-converted signal, and then down-converts the frequency of the amplified signal. As part of the amplifying means, a signal limiter reduces the range of output pulse amplitudes and protects the RF input to the down-conversion mixer from excessive power levels. Incidentally, this signal limiter also produces out-of-band harmonics that must be attenuated after down-conversion to preserve signal quality (see col. 4, Ins. 36-39). Smith uses a low-pass filter to reduce the effect of these out-of-band harmonics (see col. 4, Ins. 55-56). The same low-pass filter simultaneously reduces the effect of noise. Based on language in Smith, it may be concluded that Smith views the production of out-of-band harmonics as being on the same level of undesirability as noise (see, e.g., col. 3, Ins. 16-18 and col. 4, Ins. 55-56).

Contrary to the Examiner's contention, it would not have been obvious to modify Ishigami's harmonic generator to produce Smith's out-of-band harmonics in order to gain an improved output signal. In fact, Smith teaches away from such a combination as Smith teaches that out-of-band harmonics are as undesirable as noise. Furthermore, Smith teaches the desirability of *eliminating* the out-of-band harmonics through the use of a filter. Also, the production of harmonics in Smith is incidental, in the sense that the harmonics are an undesirable side effect of the signal limiter. As a result, those looking to produce an improved output signal in equipment having limited bandwidth would not attempt to produce out-of-band harmonics based on the teachings in Smith.

For the reasons stated above, claim 1 and all claims depending from claim 1 recite patentable subject matter.

Claims 2, 3, 6, and 7 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Smith, in further view of U.S. Patent No. 5,923,766 to Oda and in further in view of U.S. Patent No. 5,828,755 to Feremans. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Oda is directed to an audio conversion circuit that compensates for low frequency audio components that are lower than the frequency a speaker can

reproduce and are supplied to a speaker having poor low frequency response. Oda discloses the low frequency component of an input audio signal being filtered and extracted to generate even numbered harmonics. Secondary harmonics are extracted from these even numbered harmonics, amplified to an appropriate level, and then added to the original input signal.

Feremans discloses a method for improving and/or altering the quality of audio signals by isolating a number of signals from the input signals, generating higher harmonics of those isolated signals, amplifying the higher harmonics, and then combining the higher harmonics with either the original signal or a treated version of the original signal.

Claims 2, 3, 6, and 7 depend from claim 1. Neither Oda nor Feremans makes up for the above described deficiencies in the proposed Ishigami and Smith combination. Therefore, claims 2, 3, 6, and 7 are allowable for at least the reasons set forth above.

Claim 5 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Smith, in further view of Oda and in further in view of U.S. Patent No. 6,865,430 to Runton. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Runton is directed to an apparatus that may be provided in software as instructions to a digital signal processor for enhancing digital audio signals after compression and decompression. Runton discloses receiving a digital decompressed audio signal and splitting the signal into two parts. One part of the signal is harmonically enhanced and the other part has warmth added to it. Both parts of the signal are then combined and frequency equalized to provide the digitally enhanced output signal.

Claim 5 depends from claim 1. Runton does not make up for the above described deficiencies in the proposed Ishigami and Smith combination. Therefore, Claim 5 is allowable for at least the reasons set forth above.

Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Smith and in further view of U.S. Patent No. 6,606,388 to Townsend. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Townsend is directed to a technique for enhancing audio signals generated from compressed digital audio files. The first two processing modules create harmonic sequences from the low frequency components and then the high frequency components contained in the original input signals. A third processing module adds and subtracts delayed and filtered versions of the enhanced input signal with itself to create left and right channeled stereo-like outputs.

Claim 11 depends from claim 1. Townsend does not make up for the above described deficiencies in the proposed Ishigami and Smith combination. Therefore, claim 11 is considered allowable for at least the reasons set forth above.

Claims 8, 9, 13, and 14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Smith and in further view of U.S. Patent Application Publication No. 2001/0034252 to Mousty. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Mousty is directed to a ringing device for a portable telephone. Mousty discloses the use of an algorithm to add harmonics to the fundamental acoustic ring signal in order to produce a richer sound.

Claims 8, 9, 13, and 14 depend from claim 1. Mousty does not make up for the above described deficiencies in the proposed Ishigami and Smith combination. Therefore, claims 8, 9, 13, and 14 are allowable for at least the reasons set forth above.

Accordingly, reconsideration and withdrawal of all rejections under 35 U.S.C. § 103(a) is respectfully requested.

2. Conclusion

In light of the foregoing, it is respectfully submitted that the present application is in condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned representative to expedite prosecution of the present application.

Serial No.: 10/511,860

If there are any other fees resulting from this communication besides the Extension of Time, please charge same to our Deposit Account No. 18-0988, our Order No. SALBP0127US.

Respectfully submitted,

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Enclosure: Petition for Ext of Time

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